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(71) Applicants:
- **KRAFT FOODS, INC.**
  Northfield, Illinois 60093 (US)
- **MOLINS PLC**
  Blakelands, Milton Keynes MK14 5LU (GB)

(72) Inventors:
- **Seaward, David Robert**
  Coventry, CV4 8HS (GB)
- **Whitlock, Peter**
  Coventry, CV4 8HS (GB)
- **Martin, Simon**
  Coventry, CV4 8HS (GB)
- **Bailey, Thomas William**
  Coventry, CV4 8HS (GB)
- **Messing, Julian Gregory**
  Coventry, CV4 8HS (GB)

(74) Representative:
Eyles, Christopher Thomas
W.P. THOMPSON & CO.
Celcon House
289-293 High Holborn
London WC1V 7HU (GB)

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(54) Apparatus and method for handling objects on a packaging line

(57) The invention provides a method of and apparatus for handling objects, such as flattened bags (4') on a packaging line. An open topped container (3) is carried at the top of a flanged member (9) carried by a carriage (6) which is moved by an endless chain (2) at a constant speed along a first path in a conveying direction (A) through a loading station. The container (3) comprises two halves (24, 25) which are separated as the container (3) moves through the loading station in order to allow a flattened bag (4'), which moves faster than the endless chain (2) along a second path which converges with the first path, to enter the container (3) and then slow down to the same speed as the endless chain (2). The two halves (24, 25) then close thereby trapping the bottom seal (63) of the bag between the opposed portions (24d, 25d; 201, 202) at the bottom of the container (3). Plenum chambers (47, 48) in the base of the container (3) are connected via respective vacuum tubes (57, 59) to bellows connectors (58, 60) which, as the container (3) and bag (4') travel on, run adjacent to a vacuum box to effect evacuation of the plenum chambers (47, 48) and hence the chamber which surrounds the bottom part of flattened bag (4') and is formed by the bottom walls (24d, 25d; 201, 202), the side walls (24a to 24c, 25a to 25c), and two stationary members (61, 62) under which the container (3) is caused to pass to cause the flattened bag (4') to open and conform closely to the interior of the container (3).

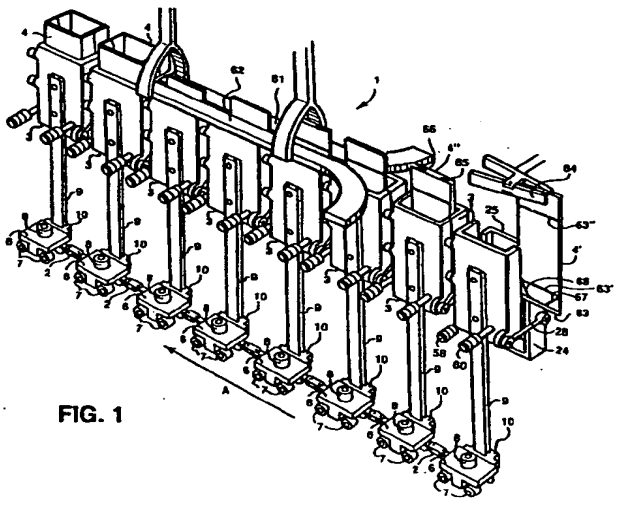

FIG. 1

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Description

This invention relates to an apparatus and method for handling objects on a packaging line.

The packaging industry is continually seeking for faster machines. In such machines it may be desired to support an object in a container as the container moves along the packaging line. Insertion of the object in the container from above at a loading station may be problematic because the object may be being conveyed prior to insertion at a different speed from the container into which it is to be inserted or because the object is in a different orientation from that required for insertion into the container or both. Sometimes the object may be approaching the loading station faster than the container; in other cases the speed of movement of the container through the loading station may be faster than that of the object to be inserted. In order to overcome this difficulty it may be necessary in conventional packaging machines to slow the container so that the correct synchronisation and orientation can be achieved at the loading station. This has the effect of slowing down operation of the whole machine. Thus achieving the correct synchronisation of the object and container at the loading station whilst simultaneously getting the object in the correct orientation may be difficult without unduly slowing down the speed of the packaging machine.

GB-A-1003768 describes an apparatus for the packing of solid or liquid materials in sealable bags or sachets. This is a hand operated machine with a carriage movable along a pathway and supporting a jig adapted to receive a bag. The jig has double walls, the inner one of which is permeable and the space between the double walls is connected to a vacuum for opening the bag under the influence of the vacuum. A suction cup attached to a tubular arm is used to transfer a bag from a magazine to the jig. After filling with biscuits or solid, granular or liquid material the operator operates a lever which folds over flaps at the upper end of the jig to fold over the top of the bag, whereupon the top of the bag is sealed. The sealed bag can then be removed from the jig, one way of achieving this being by providing a retractable bottom to the jig.

The present invention accordingly seeks to provide a method of and an apparatus for reliably inserting an object into a moving container at a loading station with the correct orientation of the object and without having to reduce the speed of movement of the container and hence of the whole packaging machine. It further seeks to provide an apparatus and a method which enable the insertion into a container moving along a first path of an object which is moving along a second path that converges with the first path and is possibly travelling at a different speed from the container.

According to the invention there is provided apparatus for inserting an object into a moving container at a loading station comprising:

a support container for an object comprising first and second separable parts which are laterally separable one from another to open the container;

means for moving the support container in open condition through a loading station along a first path;

means for moving the object along a second path which converges with the first path so that the object enters the container between the two separable parts; and

means for closing the container with the object inside it so that the object is supported in said container for further conveyance along said first path.

The invention further provides a method for inserting an object into a moving container at a loading station comprising:

providing a support container for an object comprising first and second separable parts laterally separable one from another to open the container;

moving the support container in open condition through a loading station along a first path;

moving the object along a second path which converges with the first path so that the object enters the container between the two separable parts; and

closing the container with the object inside it so that the object is supported in said container for further conveyance along said first path.

The first and second separable parts may each include a bottom wall means and side wall means, the bottom wall means of the first and second separable parts cooperating in the closed condition of the support container to form a bottom wall for the support container and the side wall means of the first and second separable parts cooperating in the closed condition of the support container to form side walls for the support container.

Preferably the support container has a substantially parallelepipedal interior shape in its closed condition. The second separable part may be pivotally linked to the first separable part by means of a parallelogram linkage so that lateral separation of the separable parts occurs by virtue of the second separable part swinging laterally outwardly and downwardly away from the first separable part. In such an arrangement the first and second separable parts may include bottom wall means which are arranged to separate along a first substantially vertical longitudinal plane and a side wall means of the second separable part can similarly be arranged to separate from a corresponding side wall means of the first separable part at at least one longitudinal end of the support container along a vertical longitudinal plane that is laterally offset from the first substantially vertical longitudinal plane. Preferably the bottom wall means are arranged to separate along a first substantially vertical longitudinal plane and the side wall means of the sec-

ond separable part is arranged to separate from the side wall means of the first separable part at one longitudinal end of the support container along a second vertical longitudinal plane that is laterally offset from the first substantially vertical longitudinal plane and at the other longitudinal end of the support container along a third longitudinal plane that is laterally offset to the other side of the first substantially vertical plane from the second substantially vertical plane. In this way an object inserted into the container along the first substantially vertical plane cannot emerge from the forward end of the container because it will first strike the side wall means of one of the separable parts at the forward end of the container.

It will normally be convenient for the apparatus to include also means for locking the support container in its closed condition.

The object may have a portion which is relatively flat and flexible, in which case the container can include opposed portions which grip said portion to locate the object in the container in its closed condition. Thus the object may be a flattened bag having a front, a back, and a bottom seal and the flattened bag may be delivered into the container so that, when the container closes, the bottom seal of the flattened bag is trapped between the opposed portions of the separable parts of the support container. In one arrangement said opposed portions comprise a fixed portion on one of the separable parts and a pivotable member on said one of the separable parts so as to be pivotable between a closed condition in which said fixed and pivotable portions cooperate to grip said portion of said object and the open position in which fixed portion and said pivotable portion are spaced one from another to allow the object to enter the container. Preferably the pivotable portion is biased towards its open position. Moreover said pivotable portion can be arranged so as to engage a bottom wall portion of the other separable part and move towards its closed position as the two separable parts close to support said object.

In the apparatus according to the invention the means for moving the object along a path in the same direction through the loading station may comprise a holder member carried by an endless belt that is arranged to run about rollers at the corners of a parallelogram linkage, the upper pair of rollers being arranged for rotation about fixed axes and the lower pair of rollers being arranged for rotation about axes which can be swung at the end of respective arms through an arc under the influence of a driving member driven by a cam surface of a cam so that the holder member, as it passes around the lower run of the parallelogram linkage, in the direction of movement of the container is accelerated, by swinging of the parallelogram linkage, in one direction to a predetermined speed which is greater than the speed of movement of the container to cause the object to be carried between the two separable parts of the support container and then, as the parallelogram linkage swings in the other direction, to be slowed as it enters the open support container to the same speed as the container.

The object can be arranged to be engaged with the holder member as the holder member passes along the upper run of the endless belt passing around the rollers. The orientation of the holder member relative to the endless belt on the upper run of the endless belt can be different from the corresponding orientation of the holder member relative to the endless belt on the bottom run of the endless belt. Thus, for example, the holder member can be pivotally mounted on a carrier with respect to the endless belt and in the orientation of the holder member with respect to the endless belt is changed by engagement of a cam follower member provided on a crank arm operatively attached to the holder member and arranged to engage with cam tracks mounted adjacent the parallelogram linkage.

The container, in one preferred form of the invention, is adapted to receive a flattened bag having a front, a back, and a bottom seal and in which the means for moving the flattened bag is arranged to deliver the flattened bag into the container so that, when the container closes, the bottom seal of the flattened bag is trapped between the bottom wall means of the separable parts of the support container. In such a form of the invention the bottom wall means may each be associated with a plenum chamber connected to respective vacuum connection means and communicating with the chamber around the flattened bag by means of passageways adjacent the side wall means of the separable parts whereby, upon evacuating the plenum chambers through the vacuum connection means, the chamber around the flattened bag can be evacuated and the flattened bag opened.

Preferably one of the separable parts includes a plenum chamber beneath the bottom of the chamber which is in communication with the chamber around the flattened bag and is connected to a vacuum connection pipe carrying a bellows connector, while the other separable part includes a plenum chamber beneath the bottom of the chamber which is in communication with the chamber and is connected to a vacuum connection pipe carrying a bellows connector; in this case a vacuum box can be mounted adjacent the path of travel of the container, the vacuum box having a operating face with one or more orifices which is disposed substantially parallel to the path of travel of the container, and a flexible belt having apertures spaced along its length can be arranged to pass across the operating face of the vacuum box, the spacing of the apertures and the timing of the belt being arranged so that, as the container with a bag therein passes the vacuum box, the bellows connectors can communicate with the vacuum box thereby to evacuate the plenum chambers and the chamber around the flattened bag so as to open the flattened bag.

First and second top closure members in such a

case can be juxtaposed above the support container along the path of the container after the container has closed, one top closure member being positioned to be adjacent the front of the flattened bag and the other top closure member being positioned adjacent the back of the flattened bag and laterally spaced one from another by a distance of from about 2 mm to about 7 mm, preferably from about 4 mm to about 6 mm.

Preferably the flattened bag will have a longitudinal seal formed by sealing together opposite side edges of a web of a sealable material and a gusseted bottom. Such gussets in the flattened bag may be defined in part by diagonal seals.

In the apparatus of the invention first and second top closure members may be positioned above the support container so that one closure member lies adjacent the front of the flattened bag and the other closure member lies adjacent the back of the flattened bag so as to form together with the bottom wall and the side walls of the support container a substantially enclosed chamber around a lower portion of the flattened bag. Such first and second top closure members may comprise stationary members. Alternatively, they can comprise endless belts preferably arranged to move in synchronism with the container as this is caused to move along its predetermined path.

In order that the invention may be clearly understood and readily carried into effect two preferred forms of bag opening and support apparatus constructed in accordance with the present invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:-

Figure 1 is a perspective view of part of a packaging machine for making evacuated packages each comprising a sealed, evacuated bag containing a charge of a comminuted material, such as roasted and ground coffee;
Figure 2 is a perspective view on an enlarged scale of one of the bag containers of the machine of Figure 1, with the container in its open condition;
Figure 3 is a similar view to that of Figure 2 showing the bag container in its closed condition;
Figure 4 is a front view of one of the bag containers removed from the machine of Figure 1;
Figure 5 is a left side view, partly in section, of the bag container of Figure 4;
Figure 6 is a top plan view, partly in section, of the bag container of Figures 4 and 5;
Figure 7 is a detail view of part of one of the carriages of the machine of Figures 1 to 6;
Figure 8 is a perspective view of a device for delivering flattened bags to the machine of Figures 1 to 6;
Figures 9 and 10 are front views of the device of Figure 8 illustrating its mode of operation;
Figure 11 is a further front view of the device of Figures 8 to 10 showing the cam surfaces for controlling the attitude of the bag-holding clips;
Figure 12 is a vertical section of a modified form of bag container in closed condition; and
Figure 13 is a similar vertical section through the bag container of Figure 12 in open condition.

Referring to Figure 1, part of a packaging machine 1 for making evacuated packages, for example evacuated sealed bags containing roasted and ground coffee is depicted. This has an endless chain 2 (only part of which is shown) which passes between and around two carousels (not shown) arranged one at each end of the machine 1. The direction of travel of endless chain 2 is shown in each of Figures 1 to 3 by arrows A. Endless chain 2 is used to convey containers 3 for bags 4 around the machine 1 to and from the portion of the machine 1 which is shown in Figure 1 and which is the portion of machine 1 in which flat preformed bags 4' are inserted into the containers 3 and opened out. Thus Figure 1 shows at its right hand side a flat bag 4' about to be inserted into a container 3 and at its left hand side a fully opened bag 4.

From the portion of the machine 1 illustrated in Figure 1 the opened bags 4 are conveyed in the direction of the arrow A to a first carousel at the left hand end of the machine (as illustrated) where the containers 3 and bags 4 are individually tared, then part filled with a first dose of roasted and ground coffee, re-weighed, and topped up to a desired weight with a second dose of the roasted and ground coffee. The containers 3 with their filled bags 4 then travel back to the right hand end of the machine 1 along a reverse path behind the illustrated part of the machine 1 in the opposite direction to arrow A and pass around the second carousel which is at the right hand end of the machine 1, that is to say the right hand end as illustrated. On this second carousel the filled bags 4 are evacuated and sealed or are evacuated, gas flushed (with, for example, carbon dioxide or nitrogen) and sealed. A small amount of a desirable coffee aroma fraction may be bled into the evacuated filled bags 4 before the sealing step in order to enhance the aroma when the sealed package is first opened. In passage along the reverse path from the first carousel to the second carousel the bags 4 and their contents may be tamped by, for example, a brief period of vertical vibration, in order to settle the contents of the bags 4 and facilitate formation of a neat parallelepipedal package.

As can better be seen from Figure 2, endless chain 2 consists of links 5 joined one to another with carriages 6 attached to appropriate links 5 at regular intervals. Carriages 6 are arranged to run on a pair of substantially parallel level tracks (not shown in Figures 1 to 3) on rollers 7. A guide roller 8 arranged to rotate about a vertical axis is mounted on each carriage 6 and runs in a guide track (also not shown in Figures 1 to 3) mounted where necessary along the runs of the endless chain 2 and on each carousel above the carriages 6 so as to

assist in preventing carriages 6 from tipping. A pair of similar guide rollers (which again are not shown in Figures 1 to 3) which are also arranged to rotate about a vertical axis are provided on the underside of each carriage 6. These further rollers run in a corresponding guide track under the endless chain 2 located between the level tracks for rollers 7; this further guide track is not shown in Figures 1 to 3.

Each carriage 6 also carries a vertical flanged member 9 which is slidably received in a bracket 10 mounted on the rear of carriage 6. Member 9 can be raised and lowered at appropriate moments in the operating cycle relative to its corresponding carriage 6 by means of a roller 11 which, at the appropriate moment or moments in the operating cycle of the machine 1, runs up a stationary ramp surface (not shown) as it is carried around the machine 1 by the endless chain 2 in order to raise member 9 and the container 3 that it carries and then runs down a corresponding ramp surface (also not shown) to lower it again.

As can be seen from Figure 2, member 9 carries at its upper end a mounting plate 12 for its associated container 3. Mounting plate 12 is provided on its rear face with three studs 13 with enlarged heads (see Figure 5, which shows only one of the studs 13). Studs 13 engage in keyways 14 (see Figure 4) in a backing plate 15 on the front of container 3. This arrangement allows for container 3 to be released temporarily from its associated member 9 at the appropriate moment in the operating cycle, specifically for taring and weighing purposes. A crank arm 16 pivotally mounted on a pivot pin 17 carries an operating roller 18 and a locking roller 19 which engages in slots 20, 21 formed in mounting plate 12 and backing plate 15 respectively to lock container 3 in place on member 9. A spring 22 is attached at one end to crank arm 16 and at its other end to a bolt 23 on mounting plate 12 and biases crank arm 16 towards its locked position, as shown in Figure 3. Operating roller 18 is arranged to bear against a stationary cam track (not shown) which is shaped so as to move roller 18 to its unlocked position, shown in Figure 2, at the appropriate point in the operating cycle of machine 1, as the container 3 is carried along by chain 2, and then to move it back to its locked position again.

Each container 3 has interior surfaces which define a substantially parallelepipedal shape. It is split vertically into two halves 24, 25. The rear half 24 of container 3 is connected to the front half 25 thereof by a parallelogram linkage formed by pivoted arms 26, 27 (see Figure 5) at its left side and by a single pivoted arm 28 at its right side. In moving from its closed position, shown in Figure 3, to its open position, shown in Figure 2, rear half 24 swings downward and rearward away from front half 25. Container 3 is held locked in its closed position by means of locking levers 29, 30 mounted one at each end of container 3 which engage respectively with pins 31, 32 on front half 25. Levers 29, 30 are biased towards their locking positions by means of respective springs 33, 34. Locking lever 29 pivots about pin 35 and carries a roller 36 which engages with a stationary cam track (not shown) when it is desired for container 3 to open. Locking lever 30 pivots about pin 37 and carries a roller 38 which engages with a corresponding stationary cam track (not shown), which runs parallel to the corresponding cam track for roller 35, to open container 3 at the appropriate point along its path. Roller 38' (see Figure 5) which is carried by rear half 24 is arranged to cooperate with a corresponding cam track (not shown) to urge rear half 24 back to its closed condition at a point further along the path of container 3 from that at which container 3 is caused to open.

Reference numerals 39, 40, 41, and 42 indicate pivot pins for arms 26, 27, while reference numerals 43 and 44 indicate pivot pins for arm 28.

As can be seen from Figure 6, the two halves 24, 25 of container 3 are somewhat asymmetrical so that the plane of separation 45 along which the two halves 24, 25 separate at the right hand end of container 3 is offset to one side of the centre line L-L while the plane 46 along which the two halves 24, 25 separate at the left hand end of the container 3 is offset to the other side of centre line L-L. However, the two halves 24, 25 separate at the base of the container 3 along the centre line L-L. The walls 24a, 24b, and 24c and base 24d together define approximately half of a parallelepiped, the remaining portion of which is defined by the walls 25a, 25b and 25c and the base 25d of half 25.

The base of the container 3 is provided with plenum chambers 47, 48 arranged one in each half 24 or 25. These plenum chambers 47, 48 are covered, except along the edges adjacent the internal walls of the respective half 24 or 25, with respective cover plates 49, 50; in Figure 6 the halves of these cover plates 49 and 50 towards the top of the Figure have been cut away to show the plenum chambers 47 and 48. Thus there are narrow slit-shaped apertures 51, 52 between the edges of cover plates 49, 50 and the internal walls of container 3 and larger substantially triangular apertures 53, 54 in the corners of the bottom of container 3. As can be seen from Figure 6, the corner of cover plate 50 can be cut away at 55. The bottom of container 3 can be made of magnetic material so that it will sit firmly on a load cell (not shown) on the first carousel during taring and weighing, at which time container 3 will have been released from member 9 by moving crank arm 16 to its unlocked position and lowering member 9 to cause studs 13 to move into the larger area parts of keyways 14. Roller 56 (see Figures 2 and 3) is arranged to cooperate with an appropriately positioned ramp surface (not shown) to impart a vertical vibratory movement to container 3 to assist in tamping of the charge of coffee or other comminuted material after the necessary weighing action has taken place.

The half 24 is provided with a vacuum connection pipe 57 with a flexible bellows connector 58 at its end; this vacuum connection pipe 57 leads to plenum cham-

ber 47. A further vacuum connection pipe 59 with a further flexible bellows connector 60 is provided on half 25. This further vacuum connection pipe 59 is connected to plenum chamber 48.

Above the path of travel of containers 3 there are mounted two guide members 61, 62 (see Figure 1); these are spaced very closely above the tops of containers 3 but are laterally spaced one from another by about 5 to 10 mm so that a near air tight enclosure is formed by each container 3 and the guide members 61, 62 as the container 3 passes under guide members 61, 62. In the region below guide members 61, 62 there is mounted a vacuum box (not shown) across whose rear perforated operating face passes an endless belt (also not shown) which moves in synchronism with chain 2 and is provided with apertures arranged so as to marry up with bellows connectors 58, 60 as each container 3 comes past the vacuum box. The rear operating face of this vacuum box is perforated so that a vacuum can be drawn through bellows connectors 58, 60 as each container 3 passes behind and in close proximity to the vacuum box in synchronism with the apertured endless belt.

As can be seen from Figure 1, a flattened bag 4', which has a bottom fin seal 63, is suspended vertically from a spring loaded clip 64 of clothes peg construction for movement in the direction of arrow A. Each bag (see flattened bag 4" in Figure 1) is formed with side gussets 65, 66. Also the bottom end of each bag (see flattened bag 4') has diagonal seals 67, 68. In addition the bag 4' has been horizontally pre-creased, as indicated at 63' and 63", at positions corresponding to where the top and bottom edges will be in the evacuated filled package. These side gussets, horizontal pre-creases and diagonal seals assist in eventual formation of a neat parallelepipedal package.

Figure 7 shows a detail of a carriage 6 and the track 69 on which this runs. Also visible is the roller 70 (to which reference has been made above) mounted underneath carriage 6. This runs in a groove 71 in track 69. Roller 8 runs in a corresponding groove 72 above the carriage 6; here it is illustrated as being in the underside of one of the carousels 73.

Figures 8 to 11 illustrate a device 74 for feeding the flattened bag 4' to the container 3, which is in open condition, at the right hand end of the part of the machine 1 shown in Figure 1 so as to feed the flattened bag 4' along a path which converges with that of the container 3. Device 74 is also designed so as to impart the desired variation in speed of movement of the clip 64. Device 74 comprises an endless belt 75 which is driven in a clockwise direction around four rollers 76, 77, 78, and 79 which are located at the corners of a frame in the shape of a floppy parallelogram formed by members 80, 81, 82, and 83. These are pivoted one to another by means of fixed pivots 84, 85 and by swinging pivots 86, 87. A cross member 88 is pivoted to the mid points of members 81, 83 on pivots 89, 90 and carries a pair of cam follower rollers 91, 92 which engage with the rim 93 of an elliptical cam wheel 94 which is mounted on axle 95. (For the sake of clarity cam wheel 94 is omitted from Figures 9 and 10). As cam wheel 94 is rotated so cam follower rollers 91, 92 follow its rim 93 and move cross member 88 from side to side which in turn causes the parallelogram linkage 80, 81, 82, 83 to swing from side to side. The extremes of this swinging movement are represented by Figures 9 and 10 respectively.

Belt 75 carries a number of clips 64 which are similar in construction to spring loaded clothes pegs. Clips 64 are each pivotally mounted on a shaft that passes through a respective carrier 96. A spring loaded push rod (not shown) extends through carrier 96. One end of this push rod bears against one end of the rear movable arm of peg 64 and the other end projects from the rear of carrier 96. Pressure upon the rearward end of the push rod causes clip 64 to open. Carrier 96 is also provided with rollers 97 which bear on the edge of the parallelogram linkage 80, 81, 82, 83 as the belt 75 moves around it. The other end of the shaft on which clip 64 is mounted carries a crank arm 98 with a roller 99. This roller 99 engages with a cam track 100 as it passes around the bottom right hand corner of the parallelogram linkage. This causes the clip 64 to pivot through 90° until it extends horizontally. As it passes around the bottom left hand corner of the parallelogram linkage so roller 99 engages with a further cam surface 101 (see Figure 11) which serves to rotate clip 64 through 90° again so that when it comes round the top left hand corner of the parallelogram linkage the clip 64 is again vertical.

In operation of the illustrated machine 1, the endless chain 2 is driven at a constant speed in the direction of arrow A. A flattened bag 4', which has a bottom fin seal 63, is suspended vertically from a clip 64 which is also moved in the direction of arrow A but somewhat faster than endless belt 2 so that it can overtake the containers 3. As can be seen from Figure 1 the container 3 at the right hand end of the illustrated part of the machine 1 is open, the rollers 36 and 38 having been forced downwards by engagement with their respective associated ramp surfaces (not shown). As the flattened bag 4' enters the open container 3 along its centre line L-L, the speed of clip 64 is reduced to match the speed of endless chain 2. Thus the flattened bag 4' and the open container 3 are now moving in synchronism. Next the open container 3 closes by allowing rollers 36, 38 to come off their ramp surface and roller 38' to engage with its corresponding ramp surface and by letting locking levers 29 and 30 return under the influence of springs 33 and 34 to their locked positions in which they engage pins 31 and 32 respectively. The bag 4' is positioned at such a height in relation to the half 25 of the open container 3 that, as the container 3 closes, the bottom fin seal 63 is trapped between the bottom edges of the two halves 24 and 25. Because the container 3 splits into two asymmetric halves 24 and 25 it is impossible for flat-

tened bag 4' to overshoot the open container 3 since its leading vertical edge will hit first the inner face of the left hand wall of the open container 3. Immediately upon closure of container 3, clip 64 which is attached to an endless belt (not shown) opens so as to release flattened bag 4' and then travels on to pick up a new flattened bag 4'. Opening of clip 64 is effected by means of a fixed ramp surface (not shown) mounted behind the path of clip 64 against which the rear end of its spring loaded push rod bears so as to move the push rod forward against its spring to open clip 64. As can be seen best from the second flattened bag from the right hand end of Figure 1, i.e. the flattened bag 4", is formed with side gussets 65, 66. Also the bottom end of each flattened bag 4' has diagonal seals 67, 68. These side gussets and diagonal seals assist in eventual formation of a neat parallelepipedal package.

The now closed container 3, with a flattened bag held firmly between the bottom edges of the two halves 24, 25 moves on under guide members 61, 62. Once the container 3 is fully under guide members 61, 62, flexible bellows connectors 58, 60 pass in front of a vacuum box (not shown) so as to draw a vacuum, via pipes 57 and 59, in the plenum chambers 47 and 48 respectively and hence via slits 51, 52 and triangular apertures 53, 54 in the main body of container 3. Because the top of container 3 is at this point nearly closed by the guide members 61 and 62, except for a narrow gap between them, air cannot readily enter container 3 except by entering the flattened bag positioned therein. As a result, the bag opens very quickly and is drawn to conform snugly to the inside shape of container 3. As the container 3 emerges from under the left hand end of the guide members 61, 62 so the material of the bag tends to open it further as shown at the left hand end of Figure 1.

The gap between guide members 61 and 62 should not be so wide, on the one hand, that an effective vacuum cannot be drawn quickly and without use of excessive power within container 3 and not so narrow, on the other hand, that the top of the bag cannot slide down somewhat into container 3 to allow full opening of the bag to occur. A lateral gap of about 5 mm has been found suitable for bags made from a printed laminate 100 μm thick consisting of a layer of polyethylene terephthalate, a layer of low density polyethylene, and a layer of peelable polyethylene, with the peelable layer on the inside of the bag. Such a bag can be used for packaging, for example, 500 g of roasted and ground coffee.

Turning now to Figures 8 to 11, device 74 is positioned below the path of movement of flattened bags 4' as they emerge from a bag forming machine bottom end first. The direction of movement of the bags 4' is indicated by arrow B in Figures 8 to 10; arrow A in Figures 8 to 10 corresponds to arrow A of Figures 1 to 3. As the clip comes around the top left hand corner of the parallelogram linkage, its push rod bears against a ramp surface (not shown) which forces it forward so that clip 64 is opened. The speed of travel of belt 75 is matched to that of the flattened bags 4' as they emerge from the bag forming machine pass in the direction of arrow B, each with its transverse fin seal at its leading end. The timing of the device 74 is so adjusted that, as each clip 64 attains a vertical attitude after passing around roller 76, it receives a flattened bag 4' (as shown in Figure 9). Clip 64 then closes as the rear end of its push rod comes off its cooperating ramp surface and carries flattened bag 4' along with it as it continues to move towards roller 77.

In order that the overall size of the packaging machine can be reduced the spacing between adjacent containers 3 along chain 2 is less than the height of a bag 4', for example approximately one half the height of a bag 4'. Since the speed of movement of the flattened bags 4' as they emerge lengthwise from the bag forming machine is greater than the speed of endless chain 2, it is necessary to slow the bag 4' as it is inserted into the appropriate container 3 to the speed of chain 2. In addition the design of machine 1 requires that a flattened bag 4' shall be inserted into the open container 3 in a vertical attitude, as shown in Figure 1, although it has been formed in a manner which results in it travelling bottom end first. The parallelogram linkage of device 64 allows the flattened bag 4' to be presented in the correct attitude and at the correct speed for insertion into open container 3.

The swinging movement of the parallelogram linkage is coordinated with the movement of the clip 64 from right to left along the lower run of belt 75 so that, as the flattened bag 4' approaches the open container 3, the linkage is swinging leftward so that clip 64 is moving faster than the speed of endless chain 2. However, as the flattened bag 4' enters the open container 3, the linkage reverses its direction of swing and commences to swing to the right, thus reducing the velocity of flattened bag 4' relative to that of the endless chain 2. As the linkage swings to the right, the right-to-left velocity of the flattened bag 4' equates to the corresponding velocity of the endless chain 2 so that the flattened bag 4' is moving at the same speed as the container 3 as this closes.

As can be seen from Figure 9, the flattened bag 4' is travelling endwise from left to right as it first captured by a clip 64. In passing over the roller 77 its attitude changes from horizontal to vertical. Then in passage around roller 78 roller 99 engages with the cam track 100 and rotates clip 64 through 90°. Thus as it commences to travel back in a leftward direction along the bottom run of belt 75 flattened bag 4' retains its vertical attitude in readiness for insertion into the open container 3. In passage around roller 79 roller 99 engages with cam track 101 which serves to rotate clip 64 through 90° again in readiness for capturing a further flattened bag 4'.

Figures 12 and 13 illustrate a modified form of con-

tainer which, while generally similar to the container of Figures 2 to 6, has a trap door arrangement in its base instead of having a fixed base. In Figures 12 and 13 the same reference numerals have been used to identify those parts which are essentially the same as those present in the embodiment of Figures 2 to 6.

In the front half 25 of the modified container of Figures 12 and 13 plenum chamber 48 is closed on its upper side by a fixed part 201 which forms part of the floor to container 3. The bottom wall means 25d of front half 25 extends somewhat rearward (i.e. to the right as illustrated in Figures 12 and 13) past the plane of separation 45 and carries a pivotable member 202 mounted on pivots 203. Rubber pads 204 and 205 are provided on part 201 and member 202 respectively and grip the bottom end of bag 4' in the closed condition of the container. Member 202 is spring biased by means of a spring (not shown) in a clockwise direction as depicted in Figures 12 and 13. As the two halves separate, as shown in Figure 13, so member 202 swings down and away from front half 25 to the position of Figure 13. In this way a wide gap is formed between pads 204, 205 which minimises the risk of the bottom end of a bag 4' hitting part of container 3 and not entering it correctly. When the container 3 closes, the lip 206 extending across the bottom of the bottom wall means 24d of rear half 24 catches under the free edge of flange 207 on member 202 and swings this anti-clockwise, as depicted in Figures 12 and 13, to move member 202 back to its closed position.

Claims

1. Apparatus for inserting an object into a moving container at a loading station comprising:

   a support container (3) for an object (4') comprising first and second separable parts (24, 25) which are laterally separable one from another to open the container (3);
   means (2, 6) for moving the support container (3) through a loading station along a first path;
   means (74) for moving the object (4') along a second path which converges with the first path so that the object (4') enters the container (3) between the two separable parts (24, 25); and
   means (36, 38) for closing the container (3) with the object (4') inside it so that the object is supported in said container for further conveyance along said first path.

2. Apparatus according to claim 1, in which the support container (3) has a substantially parallelepipedal interior shape in its closed condition.

3. Apparatus according to claim 1 or claim 2, in which the second separable part (24) is pivotally linked to the first separable part (25) by means of a parallelogram linkage (26, 27, 28) and in which lateral separation of the separable parts (24, 25) occurs by virtue of the second separable part (24) swinging laterally outwardly and downwardly away from the first separable part (25).

4. Apparatus according to any one of claims 1 to 3, in which the first and second separable parts (24, 25) include bottom wall means (24d, 25e; 201, 202), in which the bottom wall means (24d, 25d; 201,202) are arranged to separate along a first substantially vertical longitudinal plane and in which a side wall means (24a, 24c) of the first separable part (24) is arranged to separate from a corresponding side wall means (25a, 25c) of the second separable part (25) at at least one longitudinal end of the support container (3) along a vertical longitudinal plane that is laterally offset from the first substantially vertical longitudinal plane.

5. Apparatus according to claim 4, in which the bottom wall means (24d, 25d; 201, 202) are arranged to separate along a first substantially vertical longitudinal plane and in which the side wall means (24a, 24c) of the second separable part (24) is arranged to separate from the side wall means (25a, 25c) of the first separable part (25) at one longitudinal end of the support container (3) along a second vertical longitudinal plane that is laterally offset from the first substantially vertical longitudinal plane and at the other longitudinal end of the support container (3) along a third longitudinal plane that is laterally offset to the other side of the first substantially vertical plane from the second substantially vertical plane.

6. Apparatus according to any one of claims 1 to 5, further including means (29, 31, 30, 32) for locking the support container (3) closed.

7. Apparatus according to any one of claims 1 to 6, in which the means for moving the object (4') along the second path comprises a holder member (64) carried by an endless belt (75) that is arranged to run about rollers (76, 77, 78, 79) at the corners of a parallelogram linkage (80, 81, 82, 83), the upper pair of rollers (76, 77) being arranged for rotation about fixed axes (84, 85) and the lower pair of rollers (78, 79) being arranged for rotation about axes (86, 87) which can be swung at the end of respective arms (81, 83) through an arc under the influence of a driving member (88) driven by a cam surface (93) of a cam (94) so that the holder member (64), as it passes around the lower run of the parallelogram linkage (80, 81, 82, 83), in the direction of movement (A) of the container (3) is accelerated, by swinging of the parallelogram linkage (80, 81, 82, 83), in one direction to a predetermined

speed which is greater than the speed of movement of the container (3) to cause the object (4') to be carried between the two separable parts (24, 25) of the support container (3) and then, as the parallelogram linkage (80, 81, 82, 83) swings in the other direction, to be slowed as it enters the open support container (3) to the same speed as the container (3).

8. Apparatus according to claim 7, in which the object (4') is arranged to be engaged with the holder member (64) as the holder member (64) passes along the upper run of the endless belt (75) passing around the rollers (76, 77, 78, 79).

9. Apparatus according to claim 7 or claim 8, in which the orientation of the holder member (64) relative to the endless belt (75) on the upper run of the endless belt (75) is different from the corresponding orientation of the holder member (64) relative to the endless belt (64) on the bottom run of the endless belt (75).

10. Apparatus according to claim 9, in which the holder member (64) is pivotally mounted on a carrier (96) with respect to the endless belt (75) and in which the orientation of the holder member (64) with respect to the endless belt (75) is changed by engagement of a cam follower member (99) provided on a crank arm (98) operatively attached to the holder member (64) and arranged to engage with cam tracks (100, 101) mounted adjacent the parallelogram linkage (80, 81, 82, 83).

11. Apparatus according to any one of claims 1 to 10, in which said container (3) includes opposed portions (24d, 25d; 201, 202) which are capable of gripping a portion (63) of the object (4') which is relatively flat and flexible to locate the object (4') in the container (3) in its closed condition.

12. Apparatus according to claim 11, in which the object (4') is a flattened bag (4') having a front, a back, and a bottom seal (63) and in which the means (74) for moving the flattened bag (4') is arranged to deliver the flattened bag (4') into the container (3) so that, when the container (3) closes, the bottom seal (63) of the flattened bag (4') is trapped between the opposed portions (24d, 25d; 201, 202) of the separable parts (24, 25) of the support container (3).

13. Apparatus according to claim 11 or claim 12, in which said opposed portions comprise a fixed portion (201) on one of the separable parts (25) and a pivotable portion (202) pivotally mounted on said one of the separable parts (25) so as to be pivotable between a closed condition in which said fixed and pivotable portions (201, 202) cooperate to grip said portion (63) of said object (4') and an open position in which said fixed portion (201) and said pivotable portion (202) are spaced one from another to allow the object (4') to enter the container (3).

14. Apparatus according to claim 13, in which the pivotable portion (202) is biased towards its open position.

15. Apparatus according to claim 13 or claim 14, in which said pivotable portion (202) is arranged so as to engage a bottom wall portion (24d) of the other separable part (24) and move towards its closed position as the two separable parts (24, 25) close to support said object (4').

16. Apparatus according to any one of claims 11 to 15, in which the bottom wall means (24d, 25d; 201, 202) are each associated with a plenum chamber (47, 48) connected to respective vacuum connection means (57, 58, 59, 60) and communicating with the chamber around the flattened bag (4') by means of passageways (51, 52, 53, 54) adjacent the side wall means (24a to 24c, 25a to 25c) of the separable parts (24, 25);

whereby, upon evacuating the plenum chambers (47, 48) through the vacuum connection means (57, 58, 59, 60), the chamber around the flattened bag (4') can be evacuated and the flattened bag (4') opened.

17. Apparatus according to claim 16, in which one of the separable parts (24) includes a plenum chamber (47) beneath the bottom of the chamber which is in communication with the chamber around the flattened bag (4') and is connected to a vacuum connection pipe (57) carrying a bellows connector (58), in which the other separable part (25) includes a plenum chamber (48) beneath the bottom of the chamber which is in communication with the chamber and is connected to a vacuum connection pipe (59) carrying a bellows connector (60), in which a vacuum box is mounted adjacent the path of travel of the container (3), the vacuum box having a operating face with one or more orifices which is disposed substantially parallel to the path of travel of the container, and in which a flexible belt having apertures spaced along its length passes across the operating face of the vacuum box, the spacing of the apertures and the timing of the belt being arranged so that, as the container (3) with a bag (4') therein passes the vacuum box, the bellows connectors (58, 60) can communicate with the vacuum box thereby to evacuate the plenum chambers (47, 48) and the chamber around the flattened bag (4') so as to open the flattened bag (4').

18. Apparatus according to any one of claims 12 to 17, in which first and second top closure members (61, 62) are juxtaposed above the support container (3) along the path of the container (3) after the container (3) has closed, one top closure member being positioned to be adjacent the front of the flattened bag (4') and the other top closure member being positioned adjacent the back of the flattened bag (4') and laterally spaced one from another by a distance of from about 2 mm to about 7 mm.

19. Apparatus according to claim 18, in which the first and second top closure members (61, 62) are laterally spaced one from another by a distance of from about 4 mm to about 6 mm.

20. A method for inserting an object into a moving container at a loading station comprising:

providing a support container (3) for an object (4') comprising first and second separable parts (24, 25) laterally separable one from another to open the container (3);
moving the support container (3) in open condition through a loading station along a first path;
moving the object (4') along a second path which converges with the first path so that the object (4') enters between the two separable parts (24, 25); and
thereafter closing the container (3) with the object (4') inside it so that the object (4') is supported in aid container (3) for further conveyance along said first path.

21. A method according to claim 20, in which the support container (3) has a substantially parallelepipedal interior shape in its closed condition.

22. A method according to claim 20 or claim 21, in which the second separable part (24) is pivotally linked to the first separable part (25) by means of a parallelogram linkage (26, 27, 28) and in which lateral separation of the separable parts (24, 25) occurs by virtue of the second separable part (24) swinging laterally outwardly and downwardly away from the first separable part (25).

23. A method according to any one of claims 20 to 22, in which a bottom wall means (24d) of the first separable part (24) and a bottom wall means (25d) of the second separable part (25) are arranged to separate along a first substantially vertical longitudinal plane and in which a side wall means (24a, 24c) of the first separable part (24) is arranged to separate from a corresponding side wall means (25a, 25c) of the second separable part (25) at at least one longitudinal end of the support container (3) along a vertical longitudinal plane that is laterally offset from the first substantially vertical longitudinal plane.

24. A method according to claim 23, in which a bottom wall means (24d) of the first separable part (24) and a bottom wall means (25d) of the second separable part (25) are arranged to separate along a first substantially vertical longitudinal plane and in which the side wall means (24a, 24c) of the first separable part (24) is arranged to separate from the side wall means (25a, 25c) of the second separable part (25) at one longitudinal end of the support container (3) along a second vertical longitudinal plane that is laterally offset from the first substantially vertical longitudinal plane and at the other longitudinal end of the support container (3) along a third longitudinal plane that is laterally offset to the other side of the first substantially vertical plane from the second substantially vertical plane so that the object (4') is prevented by the sidewall means (25a) at the forward end of the container (3) from emerging from the forward end of the container (3).

25. A method according to any one of claims 20 to 24, in which the support container (3) is locked closed after insertion of the object (4') into the container (3).

26. A method according to any one of claims 20 to 25, in which the object (4') is moved along the second path by a holder member (64) carried by an endless belt (75) that is arranged to run about rollers (76, 77, 78, 79) at the corners of a parallelogram linkage (80, 81, 82, 83), the upper pair of rollers (76, 77) being arranged for rotation about fixed axes (84, 85) and the lower pair of rollers (78, 79) being arranged for rotation about axes (86, 87) which can be swung at the end of respective arms (81, 83) through an arc under the influence of a driving member (88) driven by a cam surface (93) of a cam (94) so that the holder member (64), as it passes around the lower run of the parallelogram linkage (80, 81, 82, 83), in the direction of movement (A) of the container (3) is accelerated, by swinging of the parallelogram linkage (80, 81, 82, 83), in one direction to a predetermined speed which is greater than the speed of movement of the container (3) to cause the object (4') to be carried between the two separable parts (24, 25) of the support container (3) and then, as the parallelogram linkage (80, 81, 82, 83) swings in the other direction, to be slowed as it enters the open support container (3) to the same speed as the container (3).

27. A method according to claim 26, in which the object (4') is engaged with the holder member (64) as the holder member (64) passes along the upper run of the endless belt (75) passing around the rollers (76, 77, 78, 79).

28. A method according to claim 26 or claim 27, in which the orientation of the holder member (64) relative to the endless belt (75) on the upper run of the endless belt (75) is different from the corresponding orientation of the holder member (64) relative to the endless belt (64) on the bottom run of the endless belt (75).

29. A method according to claim 28, in which the holder member (64) is pivotally mounted on a carrier (96) with respect to the endless belt (75) and the orientation of the holder member (64) with respect to the endless belt (75) is changed by engagement of a cam follower member (99) provided on a crank arm (98) operatively attached to the holder member (64) and arranged to engage with cam tracks (100, 101) mounted adjacent the parallelogram linkage (80, 81, 82, 83).

30. A method according to any one of claims 20 to 29, in which the object (4') has a portion (63) which is relatively flat and flexible and in which the container (3) includes opposed portions (24d, 25d; 201, 202) which grip said portion (63) to locate the object (4') in the container (3) in its closed condition.

31. A method according to claim 30, in which the object is a flattened bag (4') having a front, a back, and a bottom seal (63) and in which the flattened bag (4') is delivered into the container (3) so that, when the container (3) closes, the bottom seal (63) of the flattened bag (4') is trapped between the opposed portions (24d, 25d; 201, 202) of the separable parts (24, 25) of the support container (3).

32. A method according to claim 30 or claim 31, in which said opposed portions comprise a fixed portion (201) on one of the separable parts (25) and a pivotable member (202) on said one of the separable parts (25) so as to be pivotable between a closed condition in which said fixed and pivotable portions (201, 202) cooperate to grip said portion (63) of said object (4') and the open position in which fixed portion (201) and said pivotable portion (202) are spaced one from another to allow the object (4') to enter the container (3).

33. A method according to claim 32, in which the pivotable portion (202) is biased towards its open position.

34. A method according to claim 31 or claim 32, in which said pivotable portion (202) is arranged so as to engage a bottom wall portion (24d) of the other separable part (24) and move towards its closed position as the two separable parts (24, 25) close to support said object (4').

35. A method according to any one of claims 30 to 34, in which the bottom wall means (24d, 25d; 201, 202) are each associated with a plenum chamber (47, 48) connected to respective vacuum connection means (57, 58, 59, 60) and communicating with the chamber around the flattened bag (4') by means of passageways (51, 52, 53, 54) adjacent the side wall means (24a to 24c, 25a to 25c) of the separable parts (24, 25) and which includes the step of evacuating the plenum chambers (47, 48) through the vacuum connection means (57, 58, 59, 60) thereby to evacuate the chamber around the flattened bag (4') and to open the flattened bag (4').

36. A method according to claim 35, in which in which one of the separable parts (24) includes a plenum chamber (47) beneath the bottom of the chamber which is in communication with the chamber around the flattened bag (4') and is connected to a vacuum connection pipe (57) carrying a bellows connector (58), in which the other separable part (25) includes a plenum chamber (48) beneath the bottom of the chamber which is in communication with the chamber and is connected to a vacuum connection pipe (59) carrying a bellows connector (60), in which a vacuum box is mounted adjacent the path of travel of the container (3), the vacuum box having a operating face with one or more orifices which is disposed substantially parallel to the path of travel of the container, and in which a flexible belt having apertures spaced along its length passes across the operating face of the vacuum box, the spacing of the apertures and the timing of the belt being arranged so that, as the container (3) with a bag (4') therein passes the vacuum box, the bellows connectors (58, 60) can communicate with the vacuum box thereby to evacuate the plenum chambers (47, 48) and the chamber around the flattened bag (4') so as to open the flattened bag (4').

37. A method according to any one of claims 31 to 36, in which the chamber around the flattened bag (4') is substantially closed at the top by means first and second top closure members (61, 62) juxtaposed above the support container (3) along the path of the container (3) after the container (3) has closed, one top closure member being positioned to be adjacent the front of the flattened bag (4') and the other top closure member being positioned adjacent the back of the flattened bag (4') and laterally spaced one from another by a distance of from about 2 mm to about 7 mm.

38. A method according to claim 37, in which the first and second top closure members (61, 62) are laterally spaced one from another by a distance of from about 4 mm to about 6 mm.

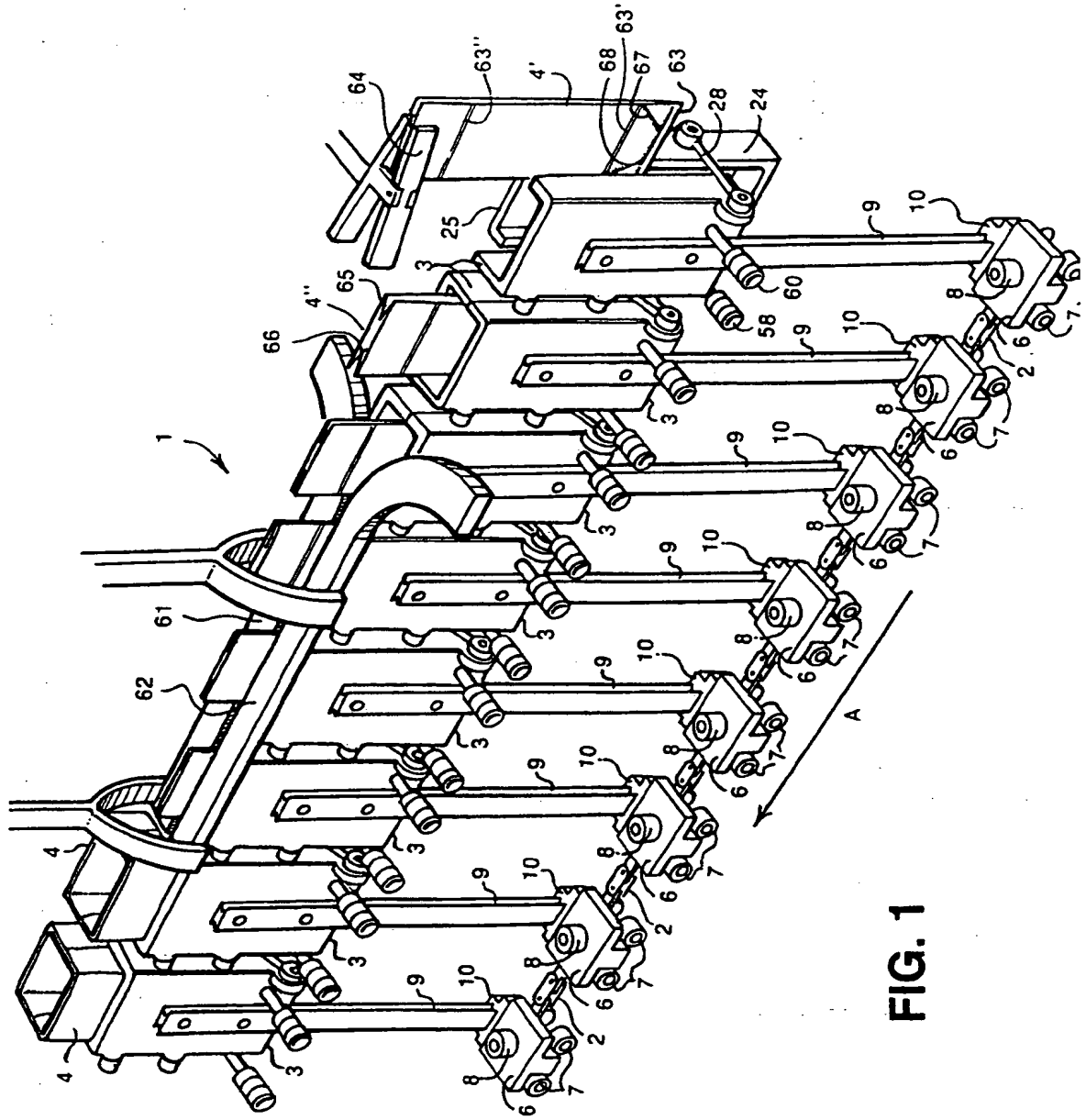


FIG. 1

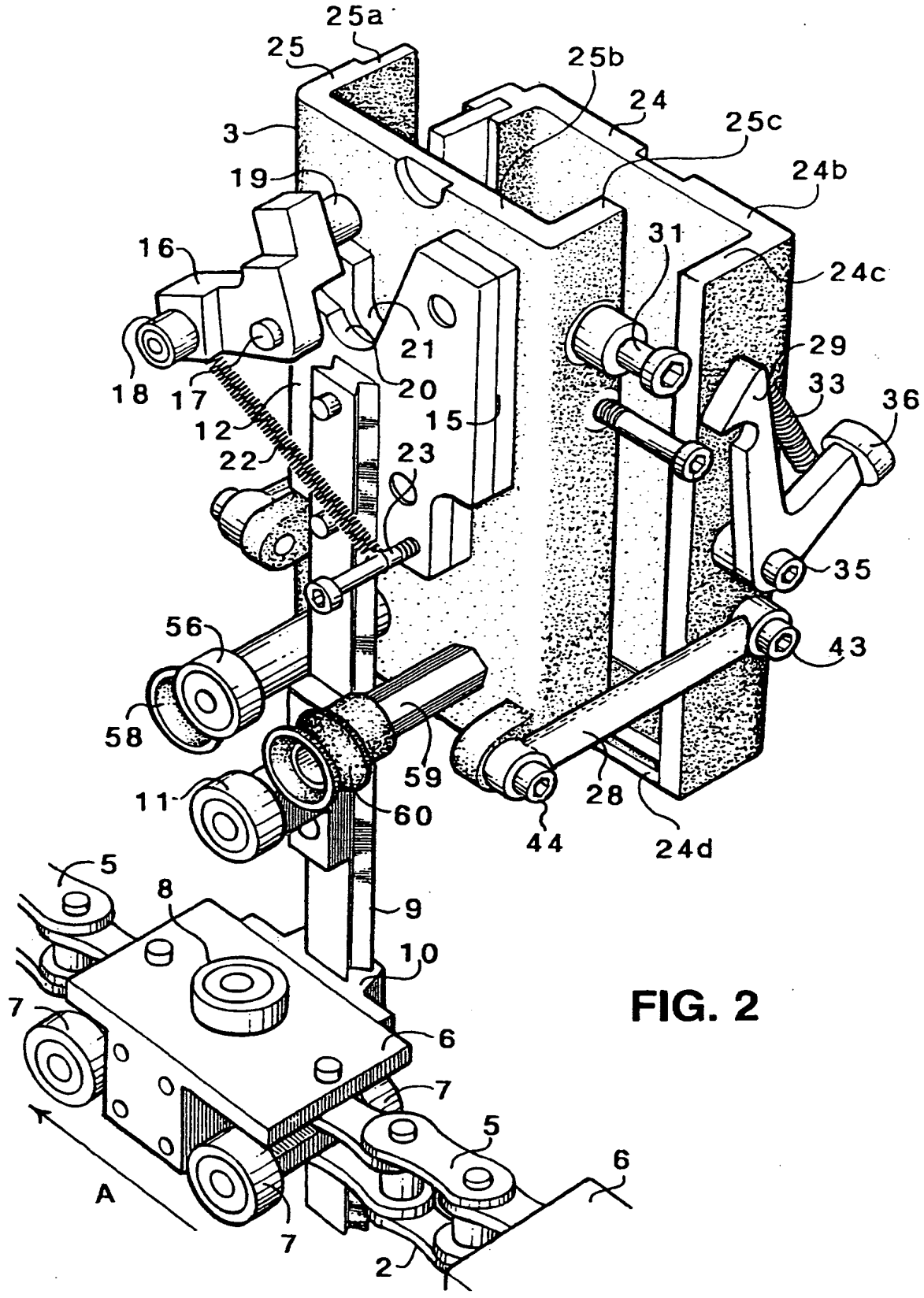


FIG. 2

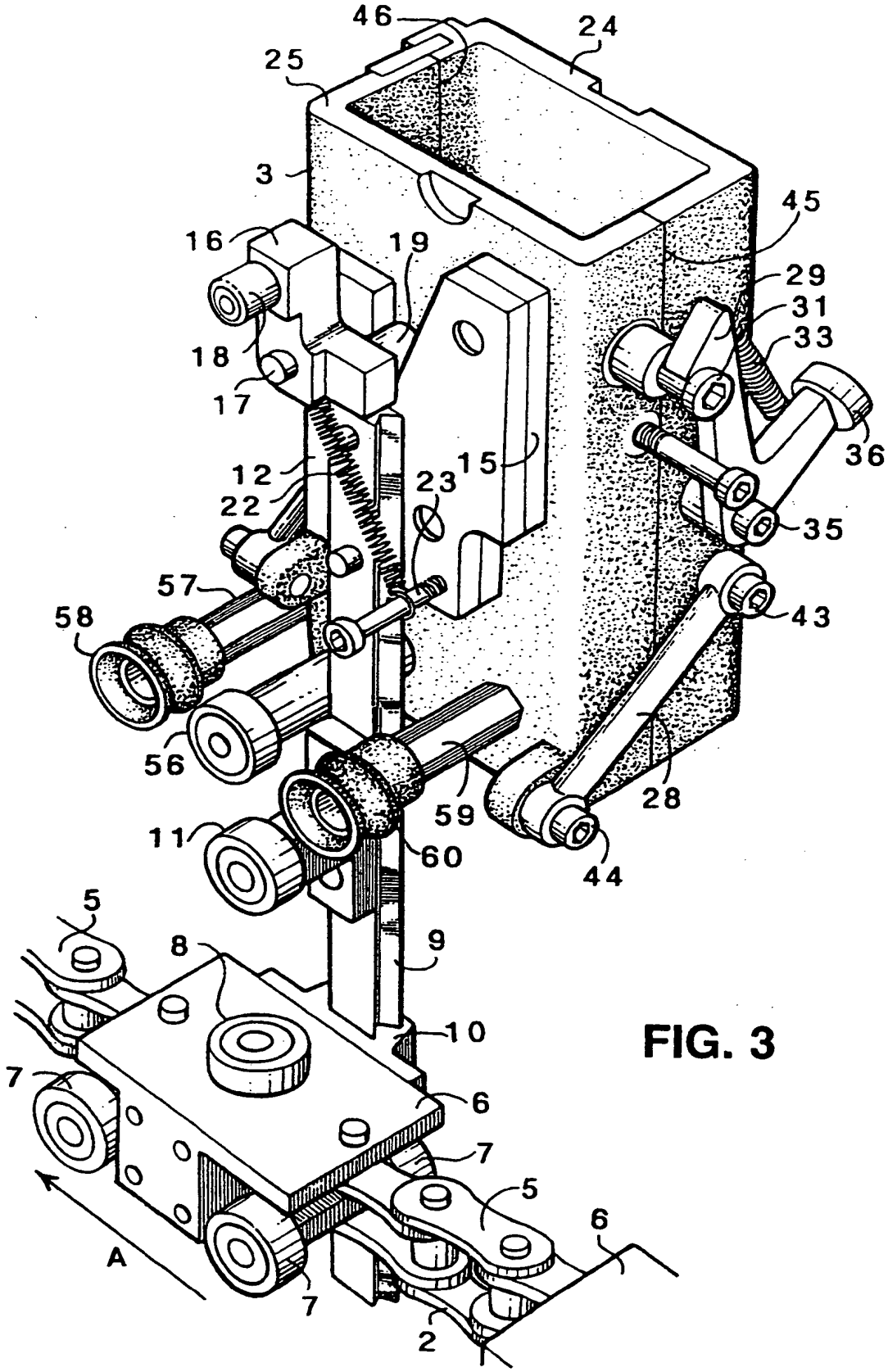


FIG. 3

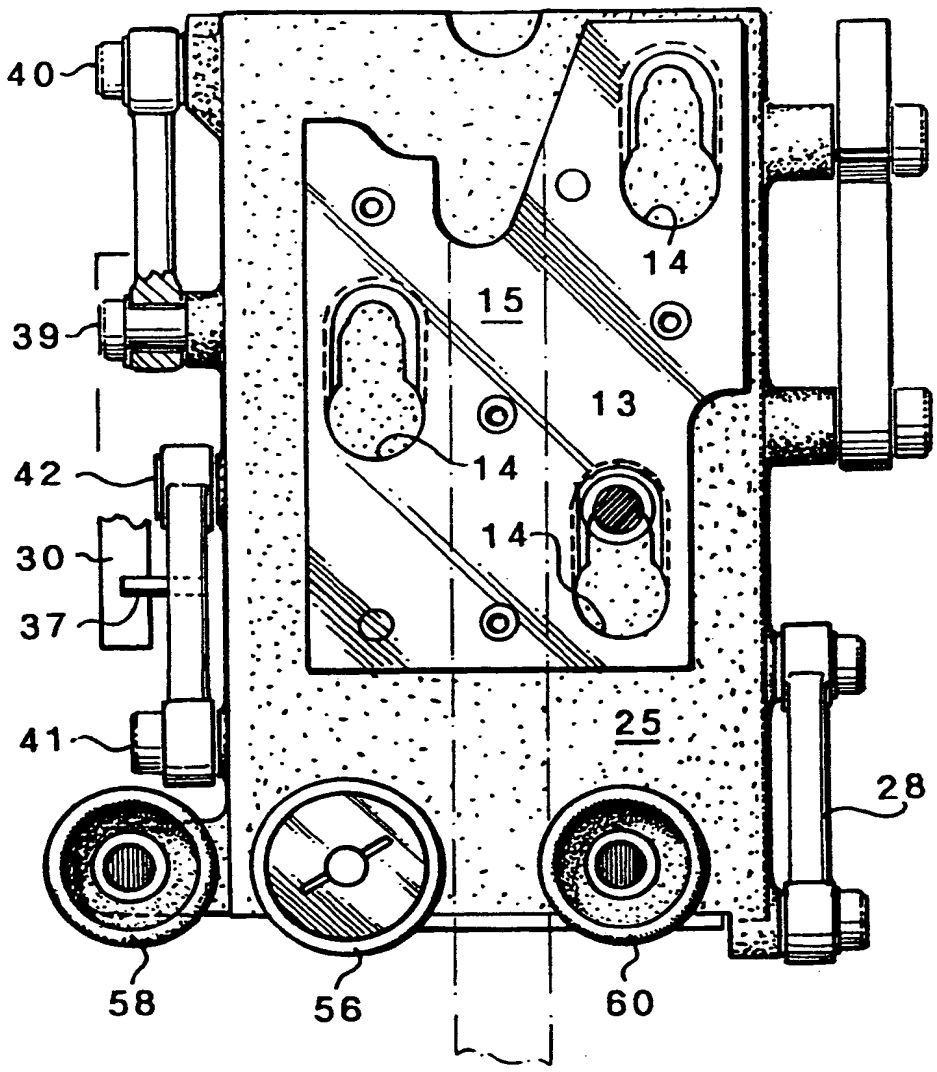


FIG. 4

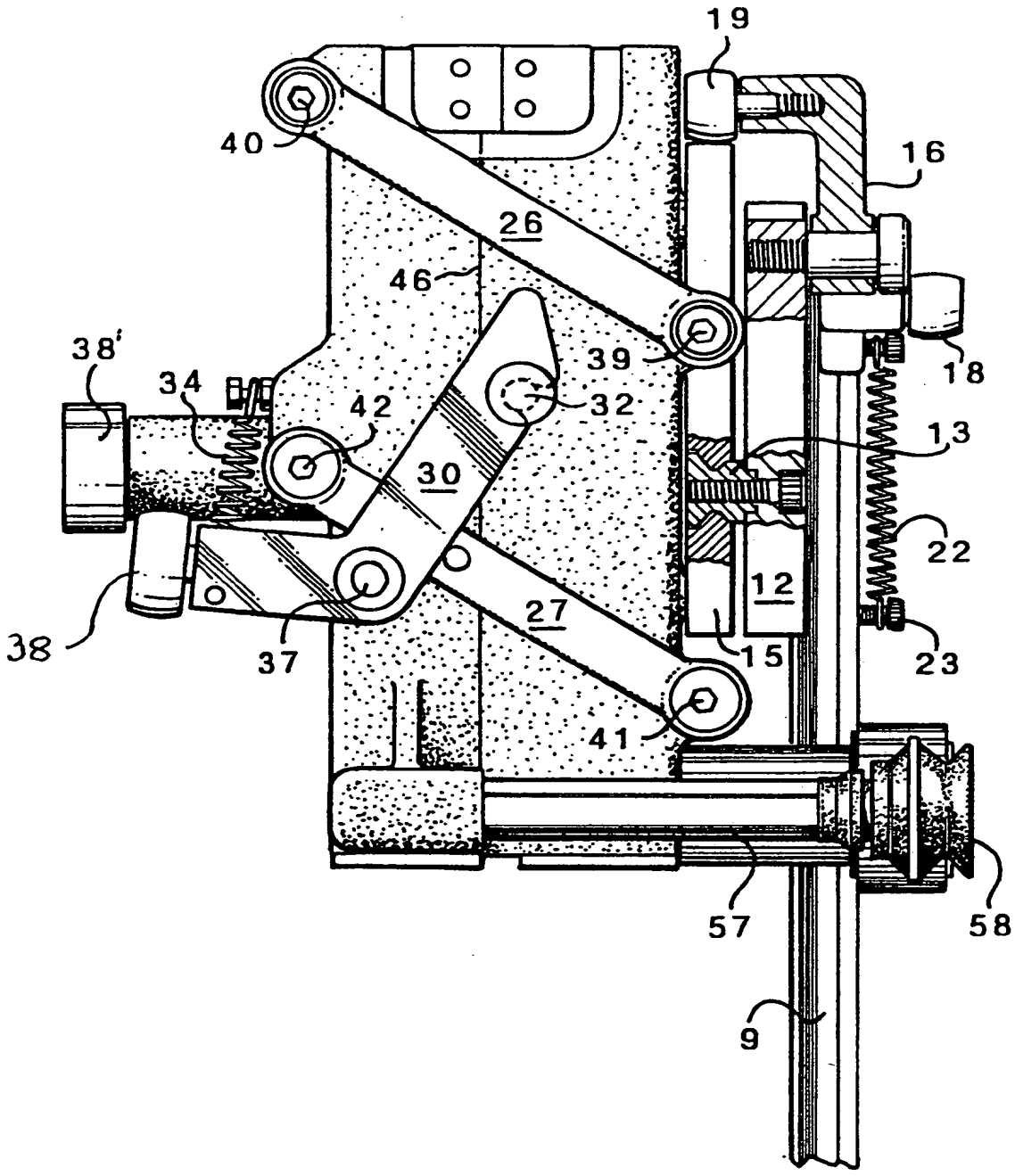


FIG. 5

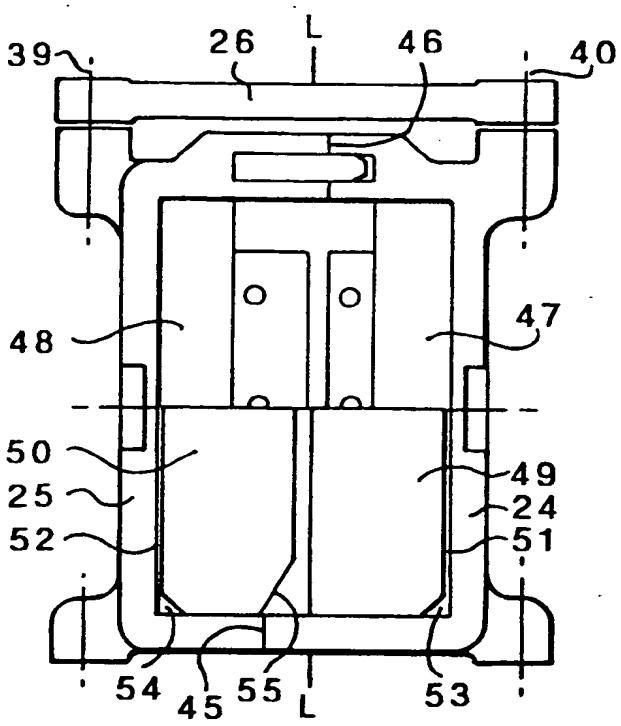
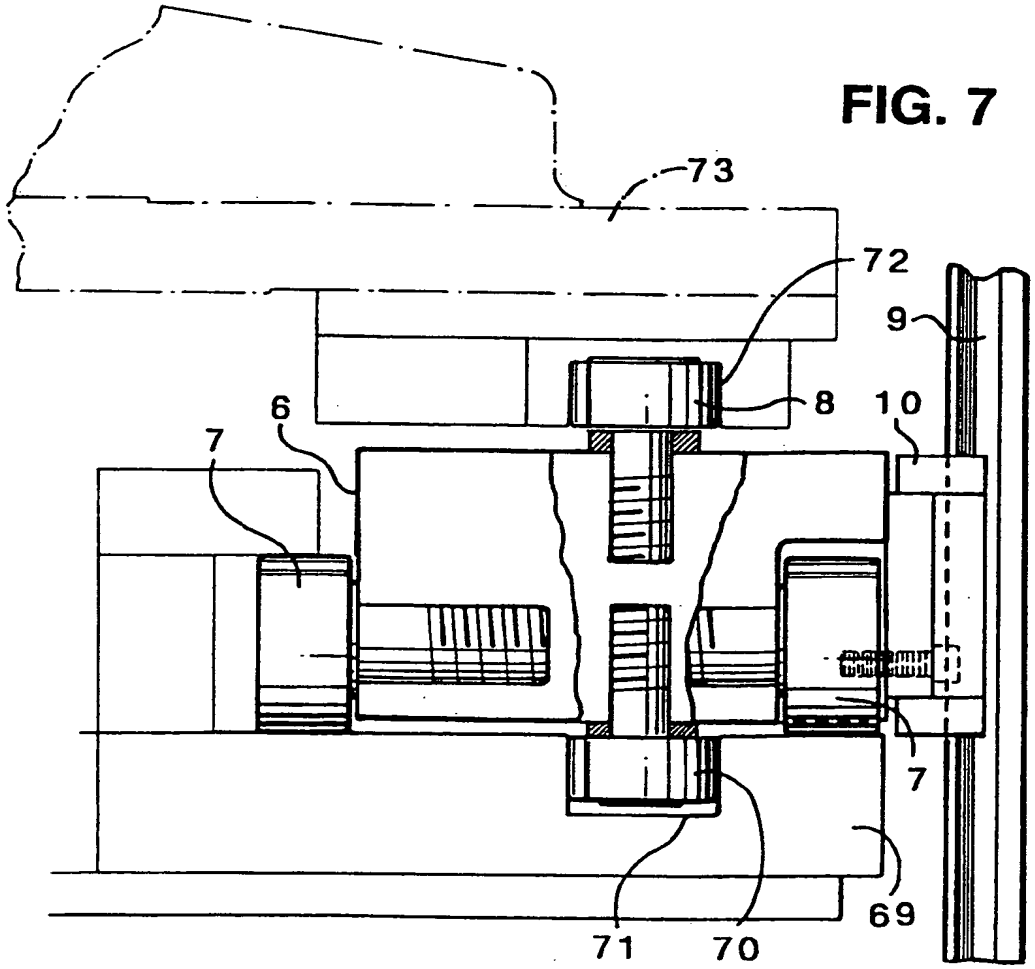


FIG. 6

FIG. 7



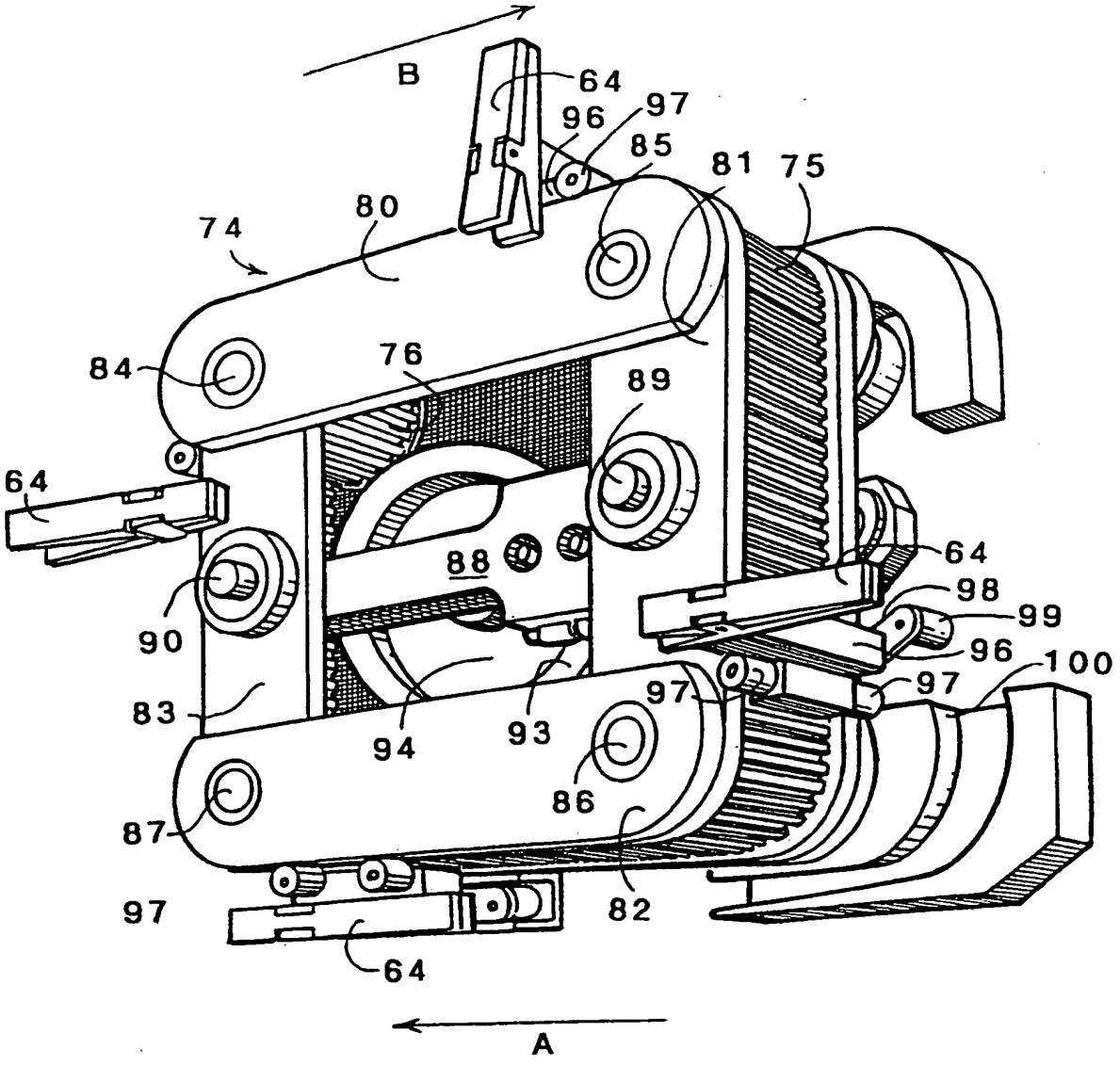


FIG. 8

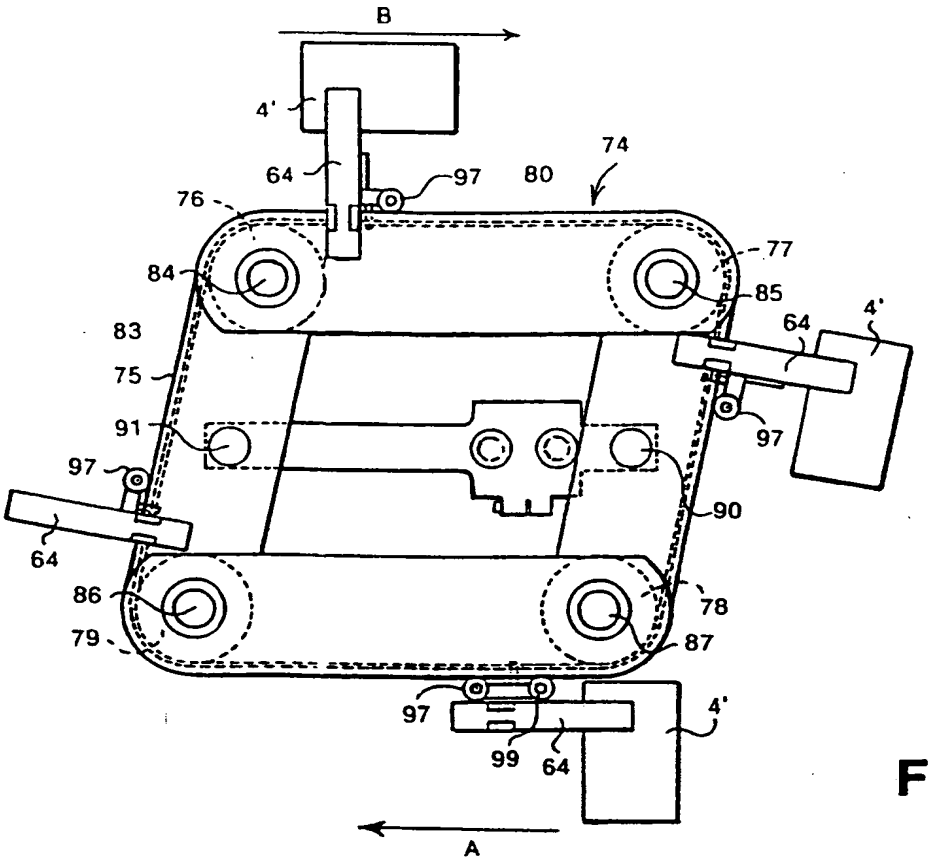


FIG. 9

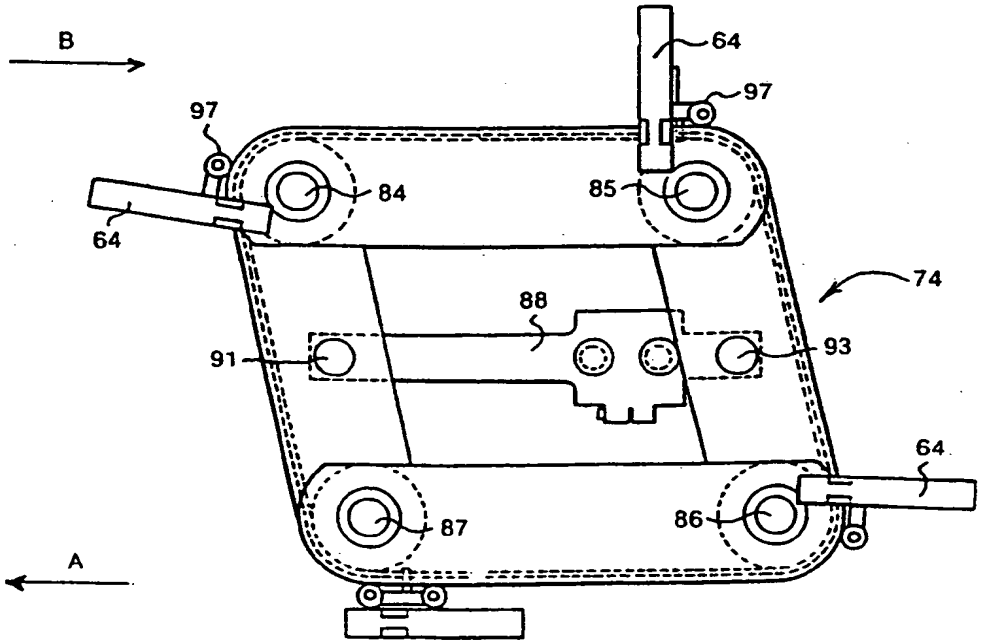


FIG. 10

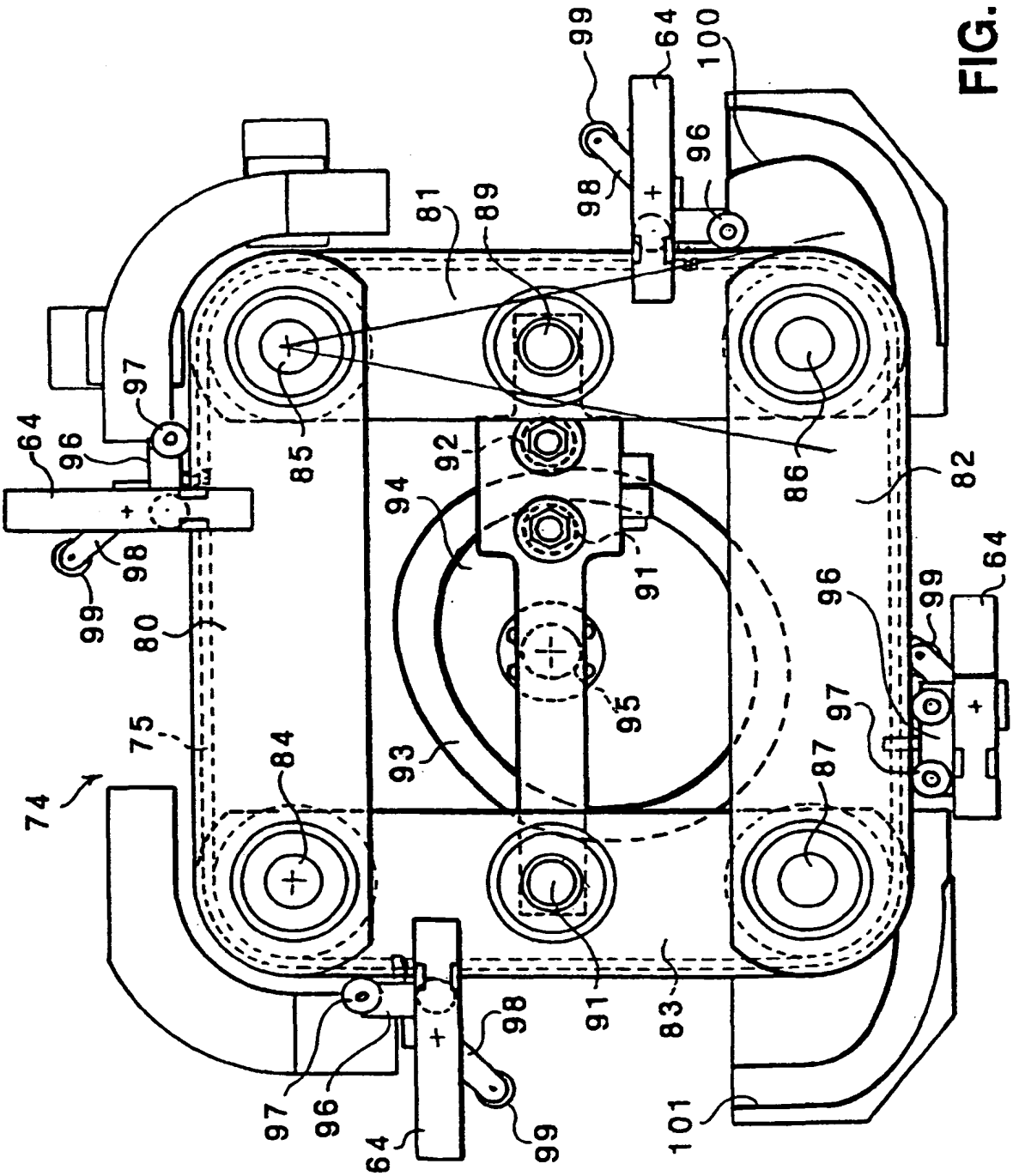


FIG. 11

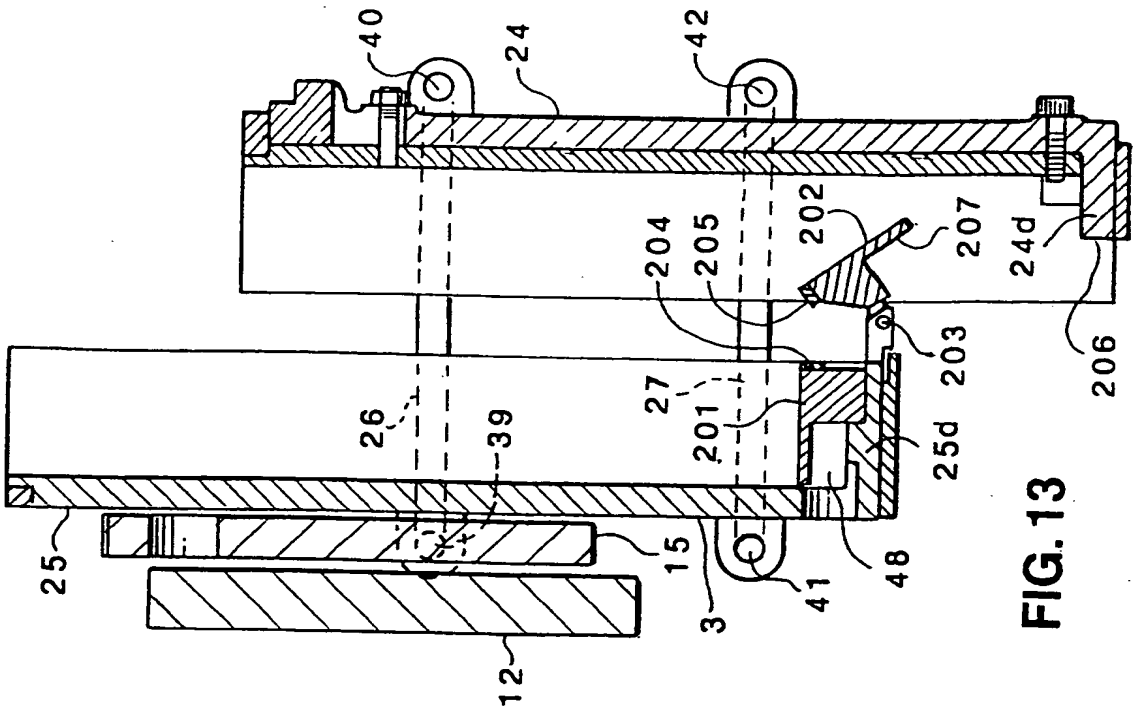


FIG. 13

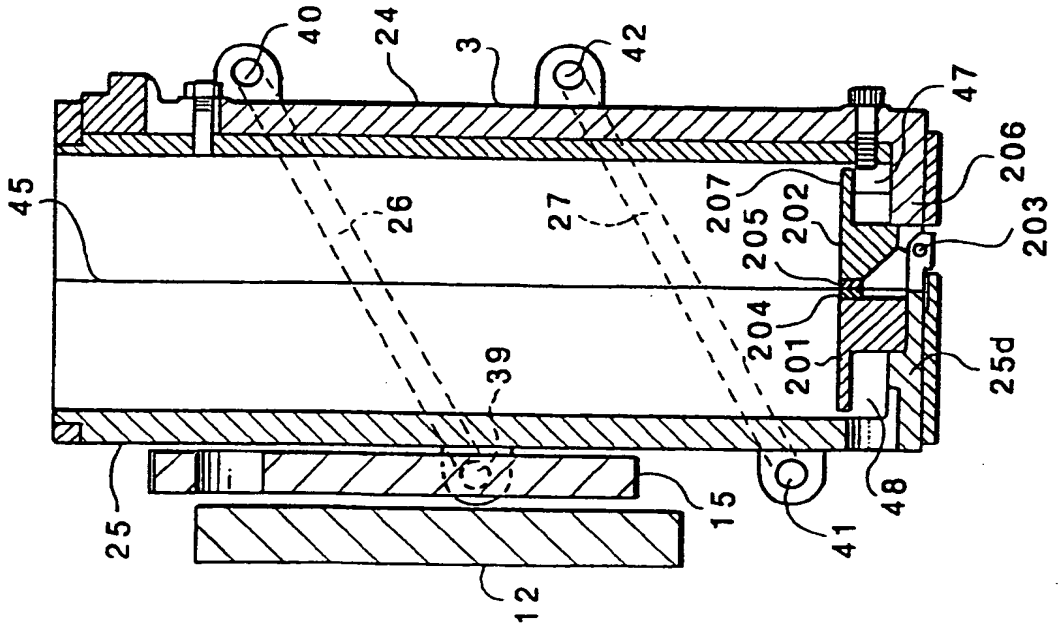


FIG. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 8529

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 4 580 393 A (FURUKAWA) * the whole document *	1,20	B65B43/52 B65B43/30
A	US 5 386 678 A (FURUKAWA) * the whole document *	1,20	
A	US 4 845 927 A (I.C.A) * the whole document *	1,20	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 April 1997	Claeys, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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